How adults look at the arithmetic program in our schools.

BOSTON UNIVERSITY

SCHOOL OF EDUCATION

THESIS

HOW ADULTS LOOK AT THE ARITHMETIC PROGRAM IN OUR SCHOOLS.

Submitted by

Philip H. Cutter

Salem Teachers' College, 1936

In partial fulfillment of requirements for

the degree of Master of Education

1942

First Reader: Dr. Guy M. Wilson, Professor of Education
Second Reader: Dr. Herbert F. Blair
Third Reader: Dr. Donald D. Durrell

Table of Contents

Part A: Problem

LIST OF GRAPHS

LIST OF TABLES

CHAPTER I

INTRODUCTION

To have the best learning, educators tell us that the pupils must possess definite goals; they must know what the new knowledge or skill means in terms of purposes in their own lives. In order to have intelligent self-direction, pupils must have some standards of value. They must have an understanding of their own particular position in regard to the entire educational program.

Tanenbaum[1] found in his study that despite the statements of the progressives, the great majority of children do not appear to evaluate school in terms of immediate interests. His study reveals that except in infrequent instances, the children do not regard school as a

[1] S. Tenenbaum, "Uncontrolled Expressions of Children's Attitudes Toward School" Elementary School Journal 40: 670-8 May 1940.

place of joy or pleasure but as an aid to later life. The school situation does not bring zest or pleasure for itself but is important for its future promise. The school being a product of the community, serves its needs. Children consider the school no differently than the adults. He concludes that "the community and not the school creates attitudes concerning the school."

Bowen[1] agrees that the goal toward which child life is tending is adult life and therefore that this is the goal toward which adjustments are to be made. Child life is largely adult life in miniature.

As adult life determines the content values of other subjects, so should it determine the social values of our arithmetic content. Let the adult group determine the ultimate goals.

[1] A. O. Bowen "Consumers Uses of Arithmetic" Teachers College, Columbia University, Contributions to Education No. 340, Copyright 1929.

It is true that the child's needs and his nature should be the basis for selecting the method and determining the placement of the material of instruction. But in a basic tool subject such as arithmetic, the quality and ultimate kind of material is based upon adult needs. The materials for learning must come from adult life, and the child should clearly grasp the purpose and enter wholeheartedly into it.

> [1] "In holding that the values which should determine the direction of education can be dug out of life-experience itself, we are denying by implication the position taken by some opposed types of philosophical theory. We affirm that genuine values and tenable ends and ideals are to be derived from what is found within the movement of experience. Hence we deny the views which assert that philosophy can derive them out of itself by ex-cogitation, or that they can be derived from authority, human or supernatural, or from any transcendent source. Our analyses of social forces are made because of the bearing of these forces upon the choice of values and the institution of purposes."

[1] The Educational Frontier, p. 294, by W. H. Kilpatrick, B. H. Bode, J. Childs, H. S. Hullfish, J. Dewey, R. Raup, V. Thayer. The Century Company. Copyright 1933.

This conception of education challenges the authority of tradition in education and questions academic pedigree as the basis of selecting subject matter. It aims to give first-hand experience in dealing with various types of problems commonly met with in individual, family, or community life.

One's way of working depends upon his aims or purposes. It is here proposed to examine a group of those who have profited by an educational system motivated largely by placing its emphasis on the disciplinary aspect, and discover how clear to these people were their objectives. By making inventory of real life situations, we can establish a more practical direction to education, a training for life as it is lived. The school in place of imposing its ideas upon the children, will guide them in obtaining the necessary data that is needed for a basis of thinking.

Such studies as Hennigar,[1] Mahoney,[2] and Quattlander[3] show that teachers can lead the child through real life situations in which he must collect data, organize those data and come to a justifiable conclusion. The schools by finding out what are real life situations, can expose the child to profitable experiences and motivate him to answer his questions after adequate study. In such work the child is taught to think, not what to think.

[1]L. Hennigar, "Informational Units for A Sixth Grade; the Family Budget," Master's thesis, Boston University, 1935.

[2]O. Mahoney, "Extending First Grade Experience in Number," Master's thesis, Boston University 1938.

[3]E. Quattlander "Replacing Systematic Drill with Informational Units in Second Grade Arithmetic," Master's thesis, Boston University, 1935.

CHAPTER II

DESCRIPTION OF WHAT IS MEANT BY INFORMATIONAL PROBLEM-SOLVING ARITHMETIC

Before taking an account of the familiarity of adults with situations involving arithmetic to reach a decision, let us examine the philosophy of developing a more rational view of arithmetic as a functional tool. It is not the part of this study to make a case for this belief, but to canvass to a limited extent the performance of arithmetic as a tool in every-day activities of grown-ups. To make clear the reason for making this survey, the author first describes how the program of community service arithmetic operates.

The textbook problem, being for the most part unreal and unfamiliar to the student, provides only drill in number facts after he has solved the riddle of just what process to use.[1] Many times the child guesses or is helped by cues or steps given to him by the teacher. These aids have no real meaning to him but he is convinced that the important aspect of the problem is to get the correct answer. Frequently the child exercises no judgment, as far as the problem is concerned, and knows no more about the real meaning behind the problem than before.[1] If he

[1] G. M. Wilson, M. B. Stone, and C. Dalrymple, "Teaching the New Arithmetic", pp. 287-298, McGraw--Hill Book Company, Inc. 1939.

gets the correct computation, he has "worked out" the problem. Whether the figures are absurd when applied to the real life situation, does not interest him. The only exercise the child gets is drill in the number facts. The puzzle of selecting the correct process serves to discourage him.

If the student needs practice in processes and number facts, it should be kept separate in the form of drill exercises which are graduated into steps of difficulty which the child is capable of mastering.

The alternative to the isolated problem type of work with its drill on type solutions is the informational or functional problem unit. This form of problem work comes close to the pupils. In this type of work, computation is not the primary aim, but the object is to provide opportunity to use judgment. It is possible to have little or almost no computation. It is in reality economics enlightened by arithmetic.

First, one starts by considering a problem that is real to the person attempting to solve it. It matters little whether the teacher prepares the situation or whether the pupils hit

upon it unaided. The teacher as well as the pupil should be ready to attack a new situation. By all working together in a co-operative spirit, the work is then mutually alive to both the instructor and the learner.

The problem has no basis in supposition but must be approached in a way directly related to life. All assumptions must be based on experience, for you cannot arrive at something any more secure than your premises. By giving such opportunity that provides for engaging in worthwhile enterprises, we have an active type of experience in which the doer not only perceives a desirable end, but works toward it.

After deciding what project or accomplishment is desired, one becomes familiar with the situation by collecting all the data pertaining to the subject at hand.[1] With the

[1] S. C. Parker, Methods of Teaching in High Schools (Ginn & Co., revised, 1915, 1920), pp. 91-92.

teacher giving suggestions, the pupils are encouraged to express their views so as to foster a sense of responsibility. Each is allowed to progress according to his ability.[1] Only after direct and specific instruction and collection of available data pertaining to the subject, are the pupils conditioned to develop the material at hand, for in order to exercise judgment, one must have a knowledge of the total situation.

Building up a large amount of data concerning the specific subject at hand, the student estimates what is relevant to the interpretation of the given problem. He selects what facts are evidence. By means of economical methods of study, the teacher guides the pupil in organizing his material. Learning takes place when he assembles his data so that they will tell their own story.

[1]W. H. Burton, The Nature And Direction of Learning, D. Appleton and Company, 1929 pp. 139-140.

Information and a large store of facts does not guarantee good judgment. It depends on training. Educators should try to stir up a problem-solving attitude toward a situation and thereby develop good judgment. Vast stores of information are of no value unless we have a critical attitude and can apply them to a situation.[1]

The public complains that pupils cannot apply what they know. Children are not to blame. They seldom have the opportunity. Making use of knowledge needs to be trained like any other skill.

When we have formed our judgment, we arrive at a decision. The analysis of the situation will result in a plan of action. Unlike arithmetic problems in the textbooks, the answer is not a numerical figure. That we are

[1] John Dewey, How We Think, D. C. Heath & Co., Boston, New York, Chicago, 1910, ppl 106-107.

ready to [illegible] and not dollars and cents is our correct answer. There being a number of possibilities and of factors influencing choice, there is no one answer. It depends not alone upon our information but also upon our judgment.

With learning as a ready-made commodity to be handed to our children, we may wonder how much consideration teachers themselves give to why they are teaching. Education has been guilty of a routine almost as mechanical as men performing in a factory assembly line. Handing out the already prepared answers for the child is a poor way of producing citizens of a government by the people. Let us have subjects correlated with one another instead of learned in isolation. Let us have goals as their own rewards instead of artificial sugar-coated inducements. In this way, we can hope to teach children how to think and how to translate their judgment into deeds.

CHAPTER III

THE STORY OF AN INFORMATIONAL PROBLEM UNIT

To best get at the meaning of "An informational problem unit", the writer gives a description of a food unit as done by a sixth grade group under his direction.

The class began by discussing the desirability of undertaking such a problem. Various suggestions were made as to methods of study. We clarified and defined the specific problem we were facing. The "adopted family", typical of the district in which the children lived, consisted of a mother and father, girl thirteen, boy eleven, and a boy nine. The weekly income of thirty dollars permitted but twelve dollars for food according to the budget as published by John Hancock Life Insurance Company.

We tried to become as familiar with the situation as circumstances would allow. The teacher as well as the pupils was ready to learn. With the teacher giving suggestions to and receiving

suggestions from the group, we gradually worked out together a method of procedure. Not being familiar with food prices, we collected price lists from newspapers and store advertisements (such as circulars that are passed out from door to door or lie on store counters). The collected data was kept by each student in a folder. Some began immediately to organize the material by cutting it up and placing it into groups as: meats, fish, vegetables, canned goods, cereals, dairy products, etc. The classification was their own but the instructor suggested that the grouping should be kept as simple as possible to make the material more workable.

The group thought it advisable to collect sample menus from magazines, cook books, and the housekeepers' section of newspapers. After sufficient time had been given to make a proper start in collecting price lists, the children were asked for suggestions as to how to familiarize themselves

with the new problem. . Many were the suggestions offered, such as: read, ask mother, talk with storekeeper, ask sister who is studying to be a dietician, and many others. We agreed to the minimum requirements for all students, and discussed possibilities of additional contributions from those who were more fortunately disposed. It is needless to list individual contributions but they may be classified into such groups as: charts on cutting meat, vitamin charts, nutrition diagrams, food health posters, and pamphlets on food nutrition.

The teacher passed out a bar graph, picturing the five nutritional values of food (protein, carbohydrates, fats, minerals, and water). The general classes of food such as: bread, milk, meat, fish, nuts, etc., were listed. Each nutritional value had a separate color to be colored in with crayon by each student. We chose the color blue for water, green for protein, yellow for fat, red for carbohydrate, and gray for mineral. These colors were appropriate for they helped suggest their

food values. Green suggests growing things; red, activity; fat is yellow; water is blue; and minerals are usually gray. It was necessary to take time to teach hygiene. This proved easy for the pupils saw a need for it.

In coloring the bar graphs, the children used an objective method of understanding the composition of certain typical foods. Although the average percentage of composition was given on the graph, the children had a better concept of meat when 65% of the bar graph was colored blue, 21% green, 12% red, and 2% gray. As 96% of the bar graph for candy was colored red, they appreciated the desirability of abstaining from eating too much of it. Balanced diet had meaning to them. The results of working on such a simple chart was greater than reading about diet or being lectured.

The twenty-one meals were planned only when we felt confident that the data gave us a workable knowledge of food values. . The pupils were cautioned that it was an easy matter to spend

too much on deserts. A balanced diet within the cost limits agreed upon, was our constant aim.

From the list of 21 meals, all the foods were listed. The list was followed by five other columns. These columns were headed: quantity to buy, price per unit, amount spent, amount used, and final cost. The itemized list of foods was also classified into such groups as: meats and fish, cereals, fats, fruits, vegetables, sugars, dairy products, and miscellaneous. This afforded an opportunity to picture a balanced diet. If deficiency in nutrition were found, it meant a reworking of the plan.

The amount of food required was not arbitrarily decided upon. In a pamphlet published by the Metropolitan Life Insurance Company entitled "Three Meals A Day", a table gave the weekly food needs for individuals of various ages and according to sex. We looked up the requirements for each member of the family on foods consumed. For example, potato requirement varied as the boy nine needed three pounds, boy eleven needed three pounds, girl

thirteen needed five pounds, father five pounds, and mother four and a half pounds. To their credit, the children wondered at the mother requiring less potato than the daughter of thirteen. This gave us a chance to apply our data on balanced diet. Each of us looked up potatoes and found them to be rich in carbohydrates. Making use of observation, we concluded that a girl of thirteen is usually active, growing fast, and quite mature physically--in fact has nearly reached her full growth.

We placed in the column, "quantity to buy" not the exact requirement of food but a convenient amount depending upon relation to price. Thus we planned to purchase not exact allotments of food, which is artifiecial, but amounts depending upon bargains, as our parents do in real cases. Price per unit was recorded and amount spent was figured. The next column gave the quantity of food used as suggested by the table in the John Hancock pamphlet. The

"cost column" figured the amount of money needed to cover the cost of food listed in the "amount used" column. This column must total in the approximate vicinity of twelve dollars.

Children soon learned that any solution arrived at would bear careful rechecking. Most first solutions needed revision. Some of the reasons for revision were the following: unbalanced diet, cost total more than twelve dollars, deserts too costly, need of being satisfied with cheaper cuts of meat. In many cases more meat could have been provided but the fact that students allowed a liberal supply of milk helped to make up for this shortage of meat. The diet in most cases consisted of a good selection of vegetables and fruits to provide bulk with not too much emphasis on starchy foods (bread and cereals) as is usual in a diet of low income. They all did very well considering that twelve dollars does not allow much freedom in the selection of food. The result of such an activity was profitablle not merely

from the arithmetic standpoint or from the knowledge accumulated as the result of working out a definite plan, but from gaining a method of procedure in attacking problems. A plan of action of this sort builds up a background that would help us in making intelligent inquiries. Instead of hesitating to ask questions and to compare various articles for fear of showing our ignorance, we felt assured that the intelligent procedure is to request a definite proof of values.

In spite of our careful consideration and study of the various factors that influence the planning of meals, we fully realize that we have merely touched upon the problem.

Our attitude toward being a buyer has changed from one of annoyance to one of eagerness as though it were a game in which there is a play of wits with the seller. Making a business purchase is not a job but a recreation if you have a sound basis for your reasoning and willingness to learn. There is a sense of satisfaction not

entirely due to a bargain gained but to a knowledge of growth and accomplishment. We feel less gullible, and more inquisitive about articles before making a purchase. We are not only more intelligent consumers of food products but of other articles as well. The method of justifying purchases is essentially the same in most cases.

We realize that good judgment can be acquired through experience. It should be noted however, that this problem is not of the usual textbook type. It comes from life, from the immediate community; this particular problem involved good management of an important function of the home, viz; providing good, well balanced meals for a family. The children undertook an adult problem, a problem which came close to their own lives.

The remainder of this thesis deals directly with this matter of adult problems in which some arithmetic may be used. What are the problems of adults; when do they use arithmetic?

CHAPTER IV

METHOD OF STUDY

To find out what arithmetic is used by the ordinary citizen to meet his every day needs, patients at the Cambridge Sanitorium that were well enough to answer and willing to co-operate were chosen for the experiment. There were fifty-six individuals brought into the study; their status as to schooling, age, and jobs are explained in the latter part of this chapter.

By using the questionaire-interview method, the individual was given an opportunity to express himself in his own words. Rather than having each one fill in a printed form, the author asked the questions directly and noted the responses.

It was difficult at times to obtain exactly what was wanted. The patients in some cases would misunderstand what was asked of them. Rather than embarrass them with lengthy discussion of what was desired, the author found it advisable to return several times to get the desired information. A lengthy interview was avoided so as not to fatigue those questioned.

All were keenly interested in the questionnaire. Most of them wished the author to express his viewpoints on questions. Answers to their requests were naturally avoided until all the data was gathered. Friendly discussions with the patients showed the author how keenly alive and interested is the public to the service the school performs for its community.

Several prelimenary forms of the questionnaire were given. The suggestions offered by several individuals were embodied into the final form. The questionnaire has six parts which cover interests and experiences in arithmetical situations.

The first part of the questionnaire concerns itself with the recency of usage of arithmetic as a tool. The question was asked, "How recently have you used arithmetic?"

The second part tries to find out what arithmetic situations are encountered by adults.

It is possible that the situations experienced most frequently by adults should form the basis of work in school to prepare children for life's difficulties. This analysis should be helpful in indicating the material needed most.

The check list of situations as worked out with the help of the patients is as follows:

paying bills
buying anything
making change
saving for gifts, trips, etc.
sending money by mail
record of money received or spent
depositing money in bank
games
recipes in cooking
operating expenses of home
figuring time (not reading)
buying cosmetics
withdrawing money in bank
traveling expenses
planning salary
reading numbers
cooking
planning a trip
insurance policy purchase
crocheting
buying luxuries
selling anything
stamps
using a time table
measuring distance
amusement problems

(list continued on following page)

looking for bargains
installment purchases
reading graphs
buying commodities
figuring pay checks
directions for knitting
auto expenses
measuring contents
planning for Christmas
making a pocketbook
figuring interest on money (loaned or borrowed)
planning an education
repair of a home
work report (factory)
measuring quantities
measuring medicine
dressmaking
store clerk
furnishing a home
measuring area
bookkeeping
music (changing time)
checking account
diet to reduce or gain
statistics
clerical work in office
per cent strength of solutions
buying auto
baseball averages
buying a home
finding profit and loss in business
payments on a house
local taxes
finding commission
income tax report
custom duties
foreign exchange
reading blueprints
investing in bonds
making graphs
investing in real estate
buying farm land
buying a house lot
investing in stocks

The third part concerns itself with the attitude toward arithmetic. This attitude is not merely a product of their own reasoning; it is also due to the impression made upon them by the school system of which they are a product. Such information should be profitable in measuring the efficiency of the job done by our

educational system and helpful in diagnosing some of its ills. The question is asked, "What is your attitude toward arithmetic?" The responses are noted verbatim.

The fourth part deals with problem work as traditionally taught in the school. The question is asked, "Have problems as taught in school ever helped you? How?" The answers are noted verbatim.

The fifth part checks the usage of units of measure in real life situations. This was done by finding out which units of measure were ever used by those questioned.

Following is the list of units of measure on which information was sought:

Lin. Measure:
- in.
- ft.
- yd.
- rod
- cubit
- furlong
- mile
- ft. & in.
- fathom
- knot
- hand
- link
- chain

Sq. Measure:
- sq. in.
- sq. ft.
- sq. yd.
- acre
- township
- sq. mile

Metric Table:
- gram
- meter
- dram
- kilometer
- liter
- cu. centimeter

Elec. Measure:
- watts
- ampere
- ohm
- kilowatts
- volts

Cu. Measure:
- cu. in.
- cu. ft.
- cu. yd.
- cord

Weight:
- grain
- oz.
- lb.
- ton
- scruple
- pennyweight

Time:
- second
- century
- decade

Quantity:
- doz.
- teaspoon
- tbl.spoon
- cases
- barrel
- gross
- quire
- ream

Liq. Measure:
- pt.
- qt.
- oz. (fluid)
- gal.

Dry Measure:
- bushel
- bale
- basket
- carload
- crate
- bag
- cup
- box
- carton
- peck
- quart
- cases

The sixth part deals with commodities that are bought by adults. By finding the frequency with which these commodities are encountered, we have a better idea of the arithmetical materials to which the school should give its attention if it is to give the children its best service. The check list on commodities that follows was obtained by using a Sears-Roebuck Catalogue:

HOME PURCHASES

Furniture
  kitchen
  diningroom
  living room
  bed room
  den
  playroom
Fuel
  oil
  coal
  wood
Groceries
  meat
  fish
  vegetables
  canned goods
Cooking utensils
Blankets & sheets
Draperies & Curtains
Radios
Refrigeration
Rental of home
Paint
Wall Paper
Lamps
Rugs
Linoleum
Electric cookers
Kitchen range
Silver ware
Dishes
Phonographs
Electric appliances
Furnaces
Screens
Mattresses
Laundry Equipment
Knitting Goods

Fountain pens
Bicycles
Soap
Clocks
Ping pong table

PERSONAL PURCHASES

Clothing
  Infants'
  Children's
  Women's
  Men's
  Shoes
  Sport clothes
Luggage
Wrist watch
Eye glasses
Cameras
Jewelry
Shaving equipment
Perfumes
Pipe
Cigarettes
Hair brushes
Hair tonic
Tooth powder or paste
Toys
Games
Flash light
Carpenters' tools
Garage mech. tools
Umbrellas
Typewriters

OTHER PURCHASES

Garden seeds
Sail boat
Motor boat
Garden equipment
Movie projector
Camping equipment
Sport equipment
Farm equipment
Weighing scales
Supplies (repair of home)
Musical instrument
Automobile
  New
  Second-hand
  Tires
  Gasoline
  Oil
  Battery
  Repairs

Types of Individuals Studied

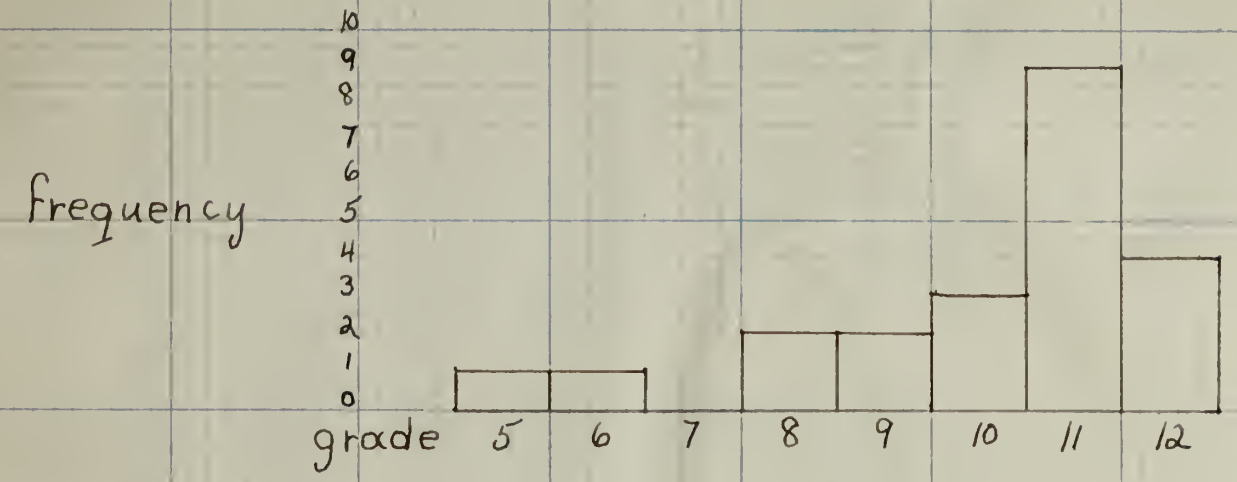
Graphs I, II, and III show the grade attainments of the group. The typical individual studied can be classified as having completed his second or third year of high school.

Table I makes him about twenty-eight years old, and Table II gives him an average job in industry or public service. The study embodies those that belong to the great majority in an urban community.

Careful inspection of Graph I reveals range of grade attainment for the 22 men studied from the fifth to the twelfth grade and a median of 11.22. The grade with the largest number of men is the eleventh with a total of 9 men.

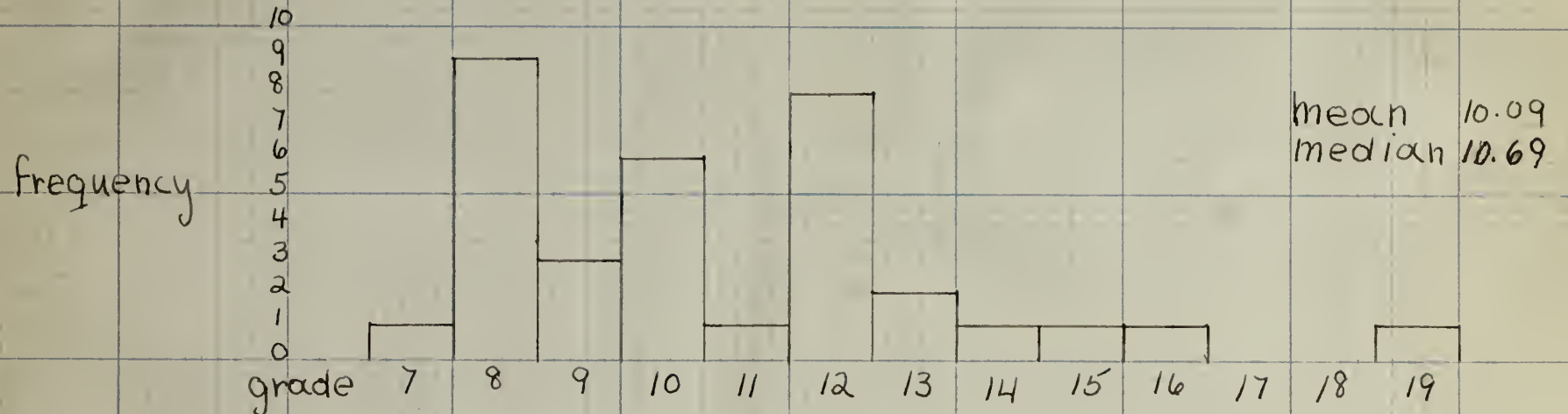
Graph II shows a range of grade attainment for the 34 women studied from the seventh to the nineteenth grade and a median of 11.22. We find a large proportion of the women falling in two grades--the eighth grade with 9 women and the twelfth grade with 8 women. An explanation for the bunching at the eighth and the twelfth year might possibly be that the 17 of them completed their schooling upon graduating from grammar school or from high school.

Graph III, a combination of the men and women, indicates that the range of grade attainment for the 56 adults studied is from the fifth to the nineteenth grade with a median of 11.00. The largest proportion of the adults falls in the eighth grade with 11 individuals and in the twelfth grade with 12 individuals.

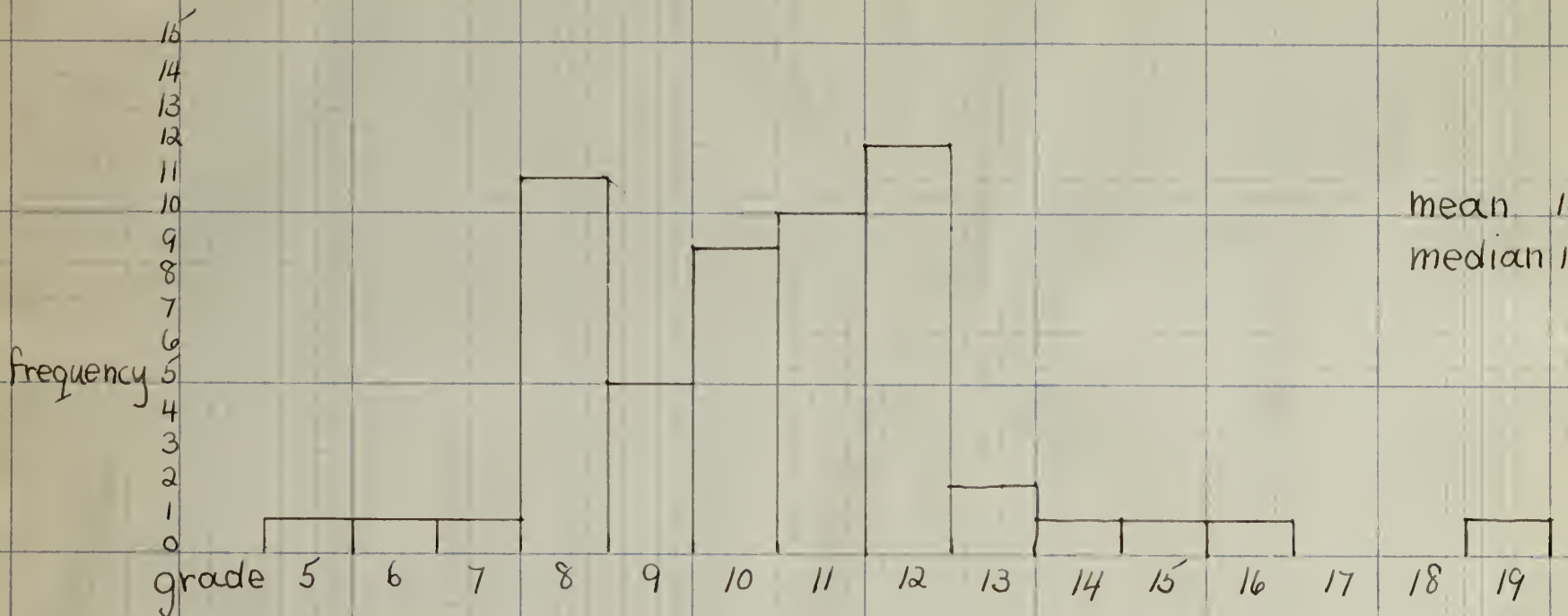


mean 10.09
median 11.22

Graph I showing grade attainment of 22 men studied



Graph II showing grade attainment of 34 women studied



Graph III showing grade attainment of the 56 adults studied

Table I shows the ages of those studied. Group I of this table has the list of ages for the 34 women. It has an age range of 17 to 42 years. The median age for this group is 28.

Group II of Table I shows an age range of 17 to 62 years for the 22 men studied. The median age is 28.

Group III of same table is a combination of the men and women and it totals 56 adults. The age range is from 17 to 62 years. The median age is 28.

An inspection of Table II discloses that there are 18 different occupations for the 34 women and 18 different occupations for the 22 men. As there are only three duplications for the separate lists for men and women (student, unemployed, and packer), we find that the 56 adults fit into 33 different classifications as to jobs.

The combined lists would seem to indicate a moderate and a low income group. There was only one individual of the group that indicated to the author that he had made "big" money. The "head waiter" spoke of working in exclusive hotels and of averaging $4,500 for a year's salary. Those that gave their positions as chocolate dipper, laundry worker, shoe trimmer, packer, domestic, handy man, and wood worker seemed likely to have received a low wage.

"Waitress" and housewife were given most frequently among the women. They both occurred six times. The men all had different occupations except for the five who were students.

Most of the group can be classified into skilled or semi-skilled workers.

TABLE I

SHOWING THE AGES OF THE INDIVIDUALS STUDIED

I WOMEN		II MEN		III COMBINED	
AGE	FREQUENCY	AGE	FREQUENCY	AGE	FREQUENCY
17	1	17	1	17	2
18	1	18	1	18	2
19	4	19	2	19	6
20	1	20	1	20	2
21	2	21	1	21	3
22	2	23	2	22	2
23	1	24	1	23	3
25	1	25	1	24	1
26	3	27	1	25	2
27	3	28	2	26	3
28	1	30	1	27	3
29	3	31	2	28	3
31	3	32	1	29	5
32	1	33	1	30	1
33	3	37	1	31	4
34	2	38	1	32	4
36	3	40	1	33	3
37	1	62	1	34	2
40	1	TOTAL	22	36	2
41	1			37	2
42	1			38	1
TOTAL	34			40	2
				41	1
				42	1
				62	1
				TOTAL	56
RANGE	17-42	RANGE	17-62	RANGE	17-62
MEDIAN	28	MEDIAN	28	MEDIAN	28
MEAN	27.82	MEAN	28.45	MEAN	28.07

TABLE II

SHOWING THE OCCUPATIONS OF THE INDIVIDUALS STUDIED

Occupations of the 34 Women:

waitress	6
housewife	6
candy packer	3
student	3
wardmaid in hospital	2
secretary	2
chocolate dipper	1
laundry worker	1
cashier	1
shoe trimmer	1
unemployed silk mill worker	1
domestic	1
shoe worker	1
telephone operator	1
attendant nurse	1
pharmacist	1
"Commissary" in restaurant	1

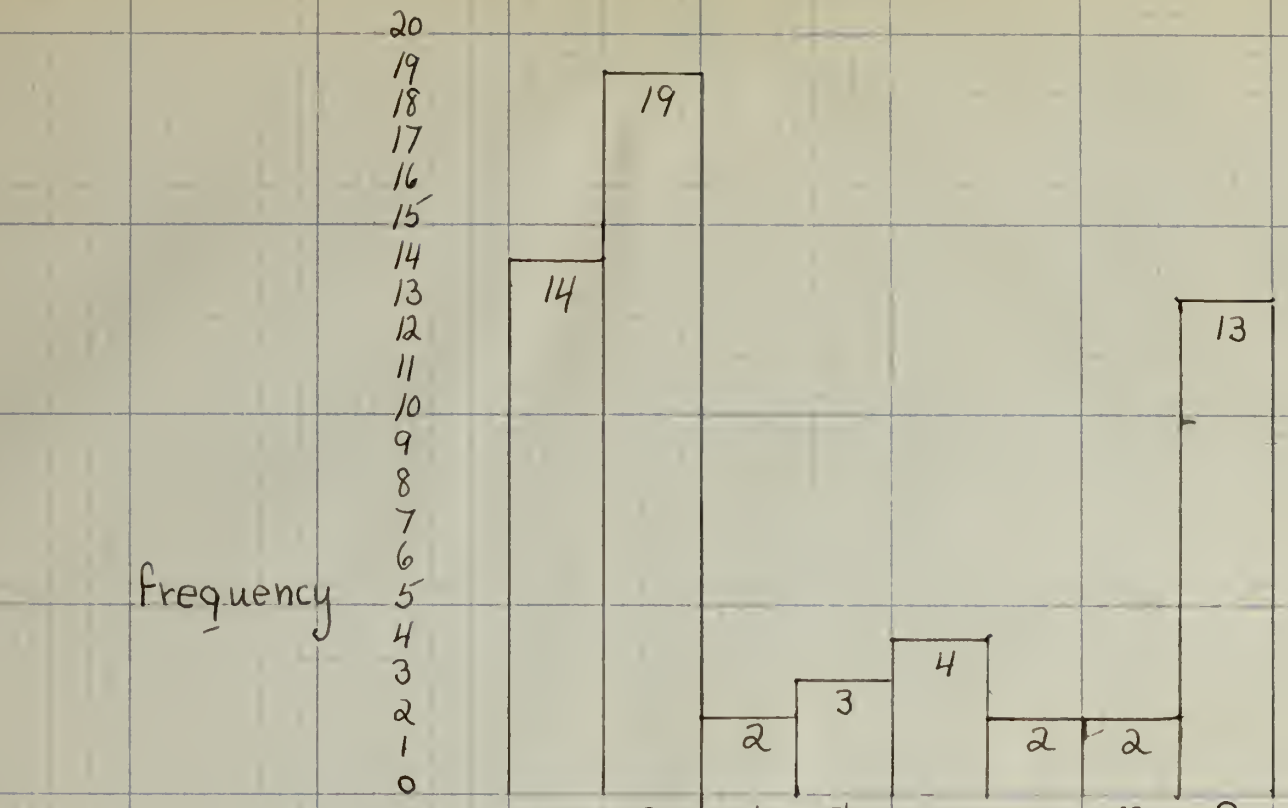
Occupations of the 22 Men:

student	5
head waiter	1
piano player in orchestra	1
store clerk	1
steel worker	1
coal and ice business	1
printer	1
unemployed	1
rubber worker	1
foreman of sewer construction	1
truck driver	1
assistant funeral director	1
registrar of motor inspector	1
handy man	1
wood worker	1
fish pier worker	1
packer in factory	1
gas station attendant	1

CHAPTER V

RECENCY OF ARITHMETIC USAGE

The responses to the question, how recently have you used arithmetic, are summarized in Graph IV. Fourteen out of forty-six or thirty per cent of the subjects had used this necessary tool the very day they were questioned. Nineteen or forty-one per cent of them had used arithmetic the day before. This makes thirty-three out of forty-six or seventy-one per cent within less than a two-day period for many were questioned in the morning before they had much opportunity for activity. Ninety per cent of those questioned were strict bed patients. Thus, despite the limited opportunity of these adults to be faced with situations that demand figuring to be solved, arithmetic was a constant and everfunctioning tool. It was involved in much of their everyday activities.



Graph IV showing responses to the question; how recently have you used arithmetic?

CHAPTER VI

ARITHMETIC SITUATIONS ENCOUNTERED BY ADULTS

To find out what situations are familiar to adults, the author first made up a list as suggested by those found in the arithmetic textbook problems. This list was soon modified. Those questioned never encountered many of the situations, particularly those pertaining to farm life. Additions were found necessary.

Looking at Tables III, IV, and V, we see that men and women face similar situations for the most part. As is to be expected, such activities as following directions for knitting, buying cosmetics, following directions for crocheting were engaged in by the women and meeting local taxes and figuring baseball averages were engaged in by the men.

Perhaps a little difficulty will be

encountered in understanding the items as listed. Explaining a few of them will serve to illustrate. The fourth item of Table III, IV, or V "saving for gifts, trips, etc.", means that the individual had to plan his money over a period of time and exercise judgment in using the money prudently to get full value and satisfaction. "Stamps" means not merely the purchasing of them but the facing of unusual situations requiring figuring such as mailing money, using the Atlantic Clipper for mailing to Europe, etc. Thus one must interpret the list in a broad sense.

The variety of experience of this group is not large. The data are indicative of the limited amount of business opportunities encountered by an average individual. In fact, when compared with the numerous types of problems as found in the textbook, they are few. The

study gives an indication of some of the problems that are discovered when a study of actual usage is made. The kind and amount of problems gives us a suggestion as to textbooks. The suggestion is that most textbook problem work has little functional value for this group or for a comparable group.

Ray[1] suggests that a class probably should not undertake a problem in a situation unless that situation is familiar to fifty per cent or more of them. If we used the standard that at least one-half the individuals encountered the situation, this study, which totals only seventy situations, finds that twenty-eight of them could be so classified. This would provide a list of problem units sufficient for the grade schools in arithmetic.

[1]E. Ray, Arithmetic Readiness In The Kindergarten and Primary Grades, Master's Thesis, Boston University, 1936, p. 150.

With such a list, we can feel confident that the material would be doing a great amount of good.

> [1]If a pupil, in going through the grades, worked over an average of two large units per year, he would cover twelve units during the first six years, or sixteen sizable units during the first eight years. In the upper grades two units a year may often be the limit. In the lower grades it will seldom be the limit. That is, in the lower grades smaller units and more of them will be the rule. It is safe to say, therefore, that a pupil in going through the grade schools following the plan of written problem work here suggested will cover from twelve to twenty, and in some cases even thirty or forty units.

If one uses the criterion that life situations are the basis of school work, Table V would indicate a program for the grade school such as follows:

"Making Change" unit is an activity

[1]G. Wilson, M. Stone, and C. Dalrymple "Teaching The New Arithmetic" pp. 334-335 McGraw-Hill Book Company, Inc., New York and London copyright 1939.

for the lower grades. By means of the "play store" idea, a situation may be developed which would be helpful in making their out-of-school life more meaningful.

With a "saving for gifts, trips, etc." unit, the teacher may direct the energies of the children into channels which should stimulate them to wholesome activities. Teaching the children to save and to make actual plans to obtain the best service with the resources at hand, is not only good arithmetic but helps to desirable life habits.

A "sending money by mail" unit will acquaint the children with a government service. An understanding of how it operates and actual contact with its process of operation will not only be profitable from a knowledge viewpoint but also from an appreciation viewpoint.

Children will have concrete evidence that the government functions for the benefit of its individuals.

The various activities that the Table V suggests such as "record of money received or spent", "depositing money in bank", "recipes in cooking", etc., are simple. The materials needed to work out the problems are available in any community and are expensive only in time and labor.

Any grade teacher of Arithmetic could profitably spend some time studying tables III, IV, and V, and in gathering data on the common business activities.of the parents of her children.

TABLE III

SHOWING THE ARITHMETIC SITUATIONS ENCOUNTERED BY 35 WOMEN, THEIR FREQUENCIES AND PERCENTAGE OF THE 35 WOMEN WHO REPORT EACH ITEM : ITEMS ARRANGED IN ORDER OF FREQUENCY

SITUATIONS	FREQUENCY	PERCENT OF TOTAL USING THIS ITEM
1. paying bills	34	97.2
2. buying anything	33	94.2
3. making change	32	91.4
4. saving for gifts, trips, etc.	32	91.4
5. sending money by mail	31	88.0
6. record of money received or spent	28	79.6
7. depositing money in bank	27	76.8
8. games	27	76.8
9. recipes in cooking	27	76.8
10. operating expenses of home	26	74.2
11. figuring time (not reading)	26	74.2
12. buying cosmetics	26	74.2
13. withdrawing money in bank	25	71.4
14. traveling expenses	24	68.4
15. planning salary	24	68.4
16. reading numbers	24	68.4
17. cooking	24	68.4
18. planning a trip	23	65.4
19. insurance policy purchase	23	65.4
20. crocheting	22	62.8
21. buying luxuries	22	62.8
22. selling anything	21	59.9
23. stamps	21	59.9
24. using a time table	20	57.1
25. measuring distance	20	57.1
26. amusement problems	20	57.1
27. looking for bargains	19	54.2
28. installment purchases	19	54.2
29. reading graphs	18	51.4
30. buying commodities	18	51.4

TABLE III (CONT.)

SITUATIONS	FREQUENCY	PERCENT OF TOTAL USING THIS ITEM
31. figuring pay checks	17	48.6
32. directions for knitting	17	48.6
33. auto expenses	17	48.6
34. measuring contents	16	45.7
35. planning for Christmas	15	42.6
36. making a pocketbook	15	42.6
37. figuring interest on money(loan or borrowed)	15	42.6
38. planning an education	14	39.8
39. repair of a home	12	37.1
40. work report(factory)	12	37.1
41. measuring quantities	12	37.1
42. measuring medicine	12	37.1
43. dressmaking	11	34.2
44. store clerk	11	34.2
45. furnishing a home	11	34.2
46. measuring area	10	31.4
47. bookkeeping	9	25.6
48. music (changing time)	9	25.6
49. checking account	9	25.6
50. diet to reduce or gain	9	25.6
51. statistics	8	22.8
52. clerical work in office	8	22.8
53. percent strength of solutions	8	22.8
54. buying auto	8	22.8
55. baseball averages	7	19.9
56. buying a home	7	19.9
57. finding profit and loss in business	6	17.1
58. payments on a house	5	14.2
59. local taxes	5	14.2
60. finding commission	5	14.2
61. income tax report	4	11.4
62. custom duties	4	11.4
63. foreign exchange	3	8.5
64. reading blueprints	3	8.5
65. investing in bonds	3	8.5
66. making graphs	3	8.5
67. investing in real estate	2	5.7
68. buying farm land	2	5.7
69. buying a house lot	1	2.8
70. investing in stocks	1	2.8

TABLE IV

SHOWING THE ARITHMETIC SITUATIONS ENCOUNTERED BY 23 MEN, THEIR FREQUENCIES AND PERCENTAGE OF THE 23 MEN WHO REPORT EACH ITEM; ITEMS ARRANGED IN ORDER OF FREQUENCY OF TABLE III

SITUATIONS	FREQUENCY	PERCENT OF TOTAL USING THIS ITEM
1. paying bills	23	100
2. buying anything	22	95.6
3. making change	21	91.3
4. saving for gifts, trips, etc.	17	73.9
5. sending money by mail	17	73.9
6. record of money received or spent	16	69.5
7. depositing money in bank	19	82.6
8. games	20	87.0
9. recipes in cooking	10	43.5
10. operating expenses of home	8	34.8
11. figuring time (not reading	16	69.5
12. buying cosmetics	1	4.3
13. withdrawing money in	16	69.5
14. bank		
14. traveling expenses	12	52.2
15. planning salary	12	52.2
16. reading numbers	18	78.3
17. cooking	8	34.8
18. planning a trip	17	73.9
19. insurance policy purchase	13	56.5
20. crocheting	1	4.3
21. buying luxuries	13	56.5
22. selling anything	15	65.2
23. stamps	10	43.5
24. using a time table	11	47.9
25. measuring distance	18	78.3
26. amusement problems	13	56.5
27. looking for bargains	13	56.5
28. installment purchases	10	43.5
29. reading graphs	15	65.2
30. buying commodities	15	65.2
31. figuring pay checks	10	43.5
32. directions for knitting	3	13.0

TABLE IV (CONT.)

SITUATIONS	FREQUENCY	PERCENT OF TOTAL USING THIS ITEM
33. auto expenses	11	47.9
34. measuring contents	10	43.5
35. planning for Christmas	10	43.5
36. making a pocketbook	6	26.1
37. figuring interest on money (loaned or borrowed)	10	43.5
38. planning an education	11	47.9
39. repair of a home	4	17.4
40. work report (factory)	2	8.7
41. measuring quantities	10	43.5
42. measuring medicine	8	34.8
43. dressmaking	0	0
44. store clerk	8	34.8
45. furnishing a home	8	34.8
46. measuring area	8	34.8
47. bookkeeping	3	13.0
48. music (changing time)	5	21.8
49. checking account	5	21.8
50. diet to reduce or gain	2	8.7
51. statistics	0	0
52. clerical work in office	5	21.8
53. percent strength of solutions	0	0
54. buying auto	6	26.1
55. baseball averages	16	69.5
56. buying a home	3	13.0
57. finding profit and loss in business	3	13.0
58. payments on a house	3	13.0
59. local taxes	7	30.4
60. finding commission	6	26.1
61. income tax report	1	4.3
62. custom duties	0	0
63. foreign exchange	2	8.7
64. reading blueprints	4	17.4
65. investing in bonds	1	4.3
67. investing in real estate	1	4.3
66. making graphs	3	13.0
68. buying farm land	2	8.7
69. buying a house lot	2	8.7
70. investing in stocks	1	4.3

CHAPTER V

[illegible] SITUATIONS ENCOUNTERED BY
58 ADULTS, THEIR FREQUENCIES AND PERCENTAGE OF
THE 58 ADULTS WHO REPORTED EACH ITEM ; LISTED
[illegible] I. ORDER OF [illegible]

SITUATIONS	FREQUENCY	PERCENT OF TOTAL VISITED THIS ITEM
1. paying bills	57	98.4
2. buying anything	55	94.8
3. making change	53	91.4
4. saving for gifts, trips, etc.	49	84.5
5. sending money by mail	48	82.8
6. record of money received or spent	44	75.9
7. depositing money in bank	46	79.4
8. games	47	81.1
9. recipes in cooking	37	63.9
10. operating expenses of home	34	58.7
11. figuring time (not reading)	42	72.4
12. buying cosmetics	27	46.6
13. withdrawing money in bank	41	70.7
14. traveling expenses	35	61.1
15. planning salary	36	62.1
16. reading numbers	42	72.4
17. cooking	32	55.2
18. planning a trip	30	60.0
19. insurance policy purchase	36	62.1
20. crocheting	23	39.7
21. buying luxuries	35	60.4
22. selling anything	36	62.1
23. stamps	31	53.5
24. using a time table	31	53.5
25. measuring distance	38	65.6
26. amusement problems	33	56.9
27. looking for bargains	38	65.2
28. installment purchases	29	50.0
29. reading graphs	33	56.9
30. buying commodities	33	56.9
31. figuring pay checks	27	46.6
32. directions for knitting	20	34.5

TABLE V (Cont.)

SITUATIONS	FREQUENCY	PERCENT OF TOTAL USING THIS UNIT
33. auto expenses	18	26.3
34. measuring contents	26	44.8
35. planning for Christmas	15	23.1
36. making a pocketbook	21	36.2
37. figuring interest on money (loaned or borrowed)	8	13.1
38. planning an education	8	13.1
39. repair of a home	16	27.6
40. work report (factory)	14	24.2
41. measuring quantities	22	37.9
42. measuring medicine	30	54.5
43. dressmaking	11	19.9
44. store clerk	13	22.8
45. furnishing a home	19	30.0
46. measuring area	18	31.1
47. bookkeeping	12	20.7
48. music (changing time)	14	24.2
49. checking account	14	24.2
50. diet to reduce or gain	11	18.9
51. statistics	8	13.8
52. clerical work in office	13	22.4
53. percent strength of solutions	8	13.8
54. buying auto	14	24.2
55. baseball averages	23	39.7
56. buying a home	10	17.2
57. finding profit and loss in business	9	15.5
58. payments on a house	8	13.8
59. local taxes	12	20.7
60. finding commission	11	18.9
61. income tax report	5	8.6
62. custom duties	4	6.9
63. foreign exchange	3	5.6
64. reading blueprints	7	12.0
65. investing in bonds	4	6.9
67. making graphs	6	10.3
67. investing in real estate	3	5.2
68. buying farm land	4	6.9
69. buying a house lot	3	5.2
70. investing in stocks	2	3.4

CHAPTER VII

ATTITUDES OF ADULTS TOWARD ARITHMETIC

Being particularly careful not to color the answers to the question: "What is your attitude toward arithmetic?", the author refused to elaborate on the question when requested for a more full explanation as to meaning. Those questioned were told to interpret as they saw fit and to reply just as the thoughts occurred to them. The English was not always the best but was expressive of their feelings. The results are tabulated in Table VI under four headings, viz. A Disciplinary viewpoint, B: Utility viewpoint; C: Like it; D: Dislike it.

By disciplinary viewpoint is meant the belief that the primary aim of subject matter is its training in developing the powers of judgement, reason, and concentration.[1]

[1]Paul Klapper, The Teaching of Arithmetic, p. 2 D. Appleton-Century Company, Inc., New York, 1916.

By utility viewpoint is meant the belief that the primary aim of subject matter is its usefulness in daily life.[1]

Forty-two of the responses (or 71%) were more concerned with the worth of arithmetic rather than with its satisfaction or annoyance. Of the seventy-one per cent, nine-tenths of them valued arithmetic for its usefulness, while only one-tenth of them valued it for its disciplinary effects.

Of the seventeen or twenty-nine per cent that thought of arithmetic only in terms of taste, fifty-nine per cent liked arithmetic. Although the result shows that the majority favor arithmetic, forty-one per cent is a large proportion to dislike it. Such a large group is evidence that the school system of which they are a product failed in doing a satisfactory job.

[1] G. Wilson, M. Stone, and C. Dalrymple, Teaching The New Arithmetic, p. 7, McGraw-Hill Company, Inc., New York and London 1939.

Best learning is that which is motivated by interest. A distaste for a subject checks the interest in it.[1]

In examining Group A, one can see that the definition of a disciplinary viewpoint was interpreted in a broad sense.

Some of the responses in Group B are an indictment against the arithmetic program under which they were trained and a good plea for the informational type of problem work as discussed in Chapters X and XI. Number 13 of Group B who said, "I wish that in school, arithmetic was made more interesting and we were taught that which we definitely would use", felt the inadequacy of the traditional type of arithmetic program.

The reader will want to study carefully the various parts of Table VI.

[1] G. D. Strayer "A Brief Course in The Teaching Process, p. 27, The Macmillan Company, New York, 1917.

TABLE VI

SOME RESPONSES ON 69 ADULTS TO THE QUESTION:
WHAT IS YOUR ATTITUDE TOWARD ARITHMETIC?

Responses are grouped as follows:
A. Disciplinary viewpoint; B. Utility viewpoint;
C. Like it; D. Dislike it.

GROUP A

1. Arithmetic is the foundation of basic thinking in business.
2. Very important! Something you should know and understand.
3. One cannot know too much about it. I am interested in doing more with it.
4. Everybody should study it.

GROUP B

1. I disliked it in school but feel it necessary for it adds a feeling of security in your own ability to think. I wish I had a better working knowledge in buying linoleum by the square yard--how to figure cost.
2. I just take arithmetic for granted--necessary tool.
3. One needs arithmetic. Can't get along without it.
4. Everyone should have some knowledge of it at least.
5. I don't care a heck-of-lot about it but it comes in handy when needed.
6. I have not had any particular use for it except for simple work.
7. I find it helpful.
8. I like it. It is very necessary to have a fair knowledge of it but there is no need to be an expert at it.
9. I don't care for it. I had difficulty with it in school. Arithmetic is not so important today for much of it can be done by machine.
10. A wonderful thing to know for everyone can use it.
11. I find it useful but was not fond of it in school.

TABLE VI (CONT.)

12. I think that it is a great thing to know; otherwise, someone may put something over on me.
13. I wish that in school, arithmetic was made more interesting and we were taught that which we definitely would use.
14. I dislike it but feel obligated to know something about it for use.
15. I take arithmetic for granted. I need it.
16. I had difficulty with it in school but feel it is a good thing to know.
17. I find it worthwhile.
18. I like arithmetic for I feel a need for it.
19. I feel a need for arithmetic.
20. I like arithmetic because there is a felt need for it.
21. I feel that only simple arithmetic was all that was needed. More than that was a waste of time.
22. I can't get along without it.
23. I think it is a good thing to know.
24. I think it is very useful
25. Useful--I wish I knew more about it.
26. I haven't much use for arithmetic but I think it is all right.
27. I like it. It's helpful in everything we do in life.
28. Arithmetic is a big help in everything. One uses it some time during the day.
29. I think arithmetic is important because you encounter it in any walk of life.
30. I think it is good to know. You never know when you will have to use it.
31. It does a lot of good for me--figuring things.
32. Interesting. It is beneficial to anyone.
33. I benefit by it. I figure my problems so much easier by use of arithmetic.
34. I like arithmetic. I use it every day and have not found it difficult.

TABLE VI (CONT.)

35. It is a necessity. You come in contact with it daily.
36. It is good to know.
37. I think it is a good thing.
38. The simple problems in arithmetic were good to teach but the others were a waste of time. I disliked it because it was difficult.

GROUP C

1. Interesting. I like it.
2. I like it. It fascinates me. No doubt it is essential to know for we couldn't get along without it.
3. I always liked arithmetic.
4. All right! I have no occasion to give arithmetic much thought but I liked it and found it easy in school.
5. I always liked it. I was good in it at school.
6. I like arithmetic. It is fine.
7. I like it. I like to figure.
8. I like arithmetic. I think it is helpful.
9. I like it. It fascinates me.
10. I like arithmetic.

GROUP D

1. I wish I didn't have to bother with it.
2. I don't like it--never good at it and never will be.
3. I don't like it. Takes too much brain work. There ought to be an easy way of doing it.
4. I like it in a way. In some ways I dislike it.
5. I don't feel so hot about it.
6. Terrible! I hate it! My worst subject in school.
7. I was never fond of it.

CHAPTER VIII

ATTITUDE OF ADULTS TOWARD PROBLEM WORK IN ARITHMETIC AS TAUGHT IN THE SCHOOLS.

Table VII shows that the average individual does not believe that the text-book problems are helpful. Their ideas on the subject are not the result of academic reasoning on the advantages and disadvantages of the effectiveness of such a method of teaching. Their answers are the result of their own experiences.

Those who feel definitely that there is no value in its training add up to twenty-three or forty per cent of the total. (See Table VII, Group D) The next largest group supposed the training was helpful but failed to see how. (See Table VII, Group C) They reasoned that this training in school must be profitable, for the schools would not be so wasteful in giving it to them. Failing to see any value in it, they were, nevertheless, confident in the school authorities' judgment. This group can be safely added to the other group as they truly failed to see any value in such training.

Combining these two groups would give us thirty-seven out of fifty-six or sixty-four per cent failing to see any value in problem solving as taught in the school.

Group B finds that such work in the school is profitable to a limited extent. Its value lies not in real life situations but in artificial circumstances. For example, Civil Service exams are mentioned by members of Group B. They indicate that Civil Service arithmetic examinations test merely the individual's ability to learn the subject. Since the school gives a training in textbook problems, questions of this type are asked. The training of itself is not necessary to the job to be filled. But responses to the question are indicative of the student's ability to learn and apply himself to a subject.

Only nine or about sixteen per cent (Group A) are sure that such training in problem work as taught in the school was profitable.

(Further discussion follows [illegible])

TABLE VII

SHOWING RESPONSES OF 58 ADULTS TO THE QUESTION:
HAVE PROBLEMS AS TAUGHT IN SCHOOL EVER HELPED
YOU? HOW?

Responses are grouped as follows:
A. Yes; B. Qualified yes; C. Not sure; D. No.

GROUP A

1. Yes! Gives me training in actual situations.
2. Yes! Gives experience that helps you to attack original problems.
3. Yes! Trained my brain to think faster in order to meet the situation.
4. Problems have helped me to think things out.
5. Oh yes! Helped me at work even though the problems there were different.
6. Oh yes! Because it has helped me to understand different problems that have come up.
7. I think it helps you to reason things out--to use your mind.
8. It has helped me a lot. Helped me to figure for my father.
9. Yes! Helped me in quizes, intelligence tests and arguments.

GROUP B

1. Yes!. In working on problems in newspaper for amusement--not used for a real situation.
2. Helped only in civil service examination.
3. I believe that the problems make you think. I like to do them.
4. Never helped except in civil service exams.
5. Oh yes!--Civil service exams.
6. Yes! Helped in thinking a problem through.
7. I believe that it did help me. But a lot of it was very unnecessary.

TABLE VII (CONT.)

8. Yes! Helps me to solve problems given in newspapers. I probably use it in some other way but I can't think off-hand how.
9. Yes! It helped me some but not sure how.
10. Problem work has helped me to solve amusement problems in newspapers.
11. It helped me a little but in these past few years, I have forgotten them. My children can teach me now.
12. Yes!--In a way it helped me. I don't know how to express it.

GROUP C

1. I know it must but don't know how.
2. Suppose they did but don't know how.
3. Yes, but I can't explain how.
4. Feel that they did but not certain as to how.
5. I imagine it did but cannot think off-hand how.
6. Feel that the problems did but can't say how.
7. Suppose so, but can't tell how.
8. Yes, but I don't know how.
9. I think problem work helps me. I can't explain why but I know it does.
10. I think it does but I can't explain how.
11. I think they helped me but I can't exactly say how.
12. I don't know but I think so. I can't remember any specific case.
13. I imagine they did but I don't know how.
14. It has to some extent. I don't know how.

GROUP D

1. No, never! The problems that you have, never come up in life.
2. It helped me when I was in school and when problem work was fresh in my mind but since then I've forgotten all of it and have no occasion to use it.

TABLE VII (CONT.)

3. No! I guess I don't really use it.
4. I am not sure but I believe that too many things were taught. I never had use for them.
5. I don't think so.
6. No! It never soaked in when I had it. I had to learn it all over again in the College of Pharmacy, Boston University.
7. I never use problems since I have been out of school--only to help my sister or brother with school work.
8. I don't think it helped me. I didn't understand problems even after the teacher would explain them.
9. No! I never had any occasion to use them.
10. I have never been able to use them.
11. It didn't help me.
12. I feel that it hasn't helped me.
13. Never helped me.
14. Had no occasion to do figuring--done by secretary --checked by calling at bank.
15. I never used them but it is good to know them.
16. I never used the problems since I have left school but I think it is nice to know.
17. I don't think so because I never had the occasion to use them.
18. Problem work has never helped me in any particular case but believe it helps at times to understand use of arithmetic.
19. Problems at work were different from any problems solved at school. I don't think that they did help.
20. No! Never referred to it.
21. Problem work did not help.
22. Never helped me.
23. I feel that problems are of no use to me but believe handy for men in industry.

Some of those in Group A feel that the problem work which they had in school had special value due to its training the intelligence of an individual. "Trained my brain to think faster in order to meet the situation" "I think it helps you to reason things out--to use your mind." However, Thorndike[1] demonstrated that no study is in itself of superior value in training the intelligence of an individual.

Those who responded in Group C must have reasoned that since the material was in the school program, such work had a definite value in real life situations. All the responses were practically the same. "I know it must but don't know how" "Suppose they did but don't know how" "Suppose so but can't tell how."

[1] E. L. Thorndike "Disciplinary Value of School Subjects" pp. 97-98 Journal of Educational Psychology February 1924.

Some in Group D believed that the problem work could have been omitted without any loss. "It helped me when I was in school and when problem work was fresh in my mind but since then I've forgotten all of it and have no occasion to use it." "I believe that too many things were taught, I never had use for them."

One intelligent individual had to go to college to learn arithmetic. "It never soaked in when I had it. I had to learn it all over again in Boston University and The College of Pharmacy."

CHAPTER IX

USEFULNESS OF UNITS OF MEASURE TO ADULTS

Tables VIII and IX, pages show that men and women are much alike in the use of units of measure. The only appreciable difference was in the case of electric measures. While women's problems rarely dealt with electricity, men employed such knowledge chiefly in dealing with their automobiles. The interest in electricity was developed because of ignition problems connected with automobiles, rather than because of vocational usage of electricity.

The data of Table X, page support the evidence of Louth[1], Sala[2], and Wilson[3] that

[1]Mary de S. Louth, "Units of Measurement in Industry", Master's thesis, Boston University, 1931.

[2]Vincent Sala, "Denominate Numbers Used in Four Factories of New Britain, Conn.", Master's thesis, Boston University, 1931.

[3]Dorothy W. Wilson, "What Measures Do People Know and Why"? Master's thesis, Boston University, 1936.

measures used by adults are simple and most of them are seldom or never used. The metric table was unimportant to the average individual. Those that did have use for it had special training in the field in which it was employed.

Since the needs of measures are quite limited, the time employed by the schools in teaching the table of measures and denominate numbers could be more profitable utilized in more essential work. The process, so meaningless to the child at the time of learning, should be taught as reference work rather than drill.

Dorothy Wilson's[1] study in a series of similar studies (Louth, Sala, and Traniello) indicates the uselessness of much that is taught in denominate numbers. She says:

> "One cannot escape the conclusion that maturation and experience are the chief factors accounting for knowledge of measures. It would appear that the facts of denominate numbers and measures are in the nature of encyclopediac information to be looked up when needed and not taught with the expectation that, if memorized, the facts will be remembered.
>
> "Adults know very well the measures used in buying and selling commodities with which they have had experience; they know little about the measures used in buying and selling commodities with which they have not had experience. Adults know very well the tabled facts which they commonly use. They do not know those which they do not use, even when they were studied in school. In general they are not able to estimate heights, lengths, and distances with any creditable degree of accuracy."

[1] Dorothy W. Wilson, "What Measurements Do People Know and Why?" Master's thesis, Boston Universtiy, 1936, p. 90.

Table X shows that there are measures that have a widespread use. The linear measures of inch, foot, yard, mile, and feet and inches were commonly used tools. The only other frequently used measures were: weight such as ounces and pound; quantity such as dozen, teaspoon, and tablespoon; liquid measures such as pint, quart, and gallon; and dry measures such as bushel, basket, bag, cup, box, carton, and peck.

Some measures were never used at all. The measures furlong, cubit, link, chain, meter, kilometer, cubic centimeter, pennyweight were outside of their experiences.

Fathom, knot, and hand were terms used by one individual that had worked at the Boston Fish Pier. One woman who had lived on a farm found it necessary to measure wood by the cord. Ream and quire were familiar to a young woman who had worked with stationery.

This study adds to the evidence of previous studies by Louth, Sala, Traniello, and Wilson on measures.

TABLE VIII*

SHOWING THE UNITS OF MEASURE USED BY 34 WOMEN IN REAL LIFE SITUATIONS

	Frequency	Per Cent of Total
Lin. Measure		
in.	30	88.2
ft.	28	82.4
yd.	30	88.2
rod	2	5.9
cubit	0	0
furlong	0	0
mile	23	67.6
ft. & in.	19	55.9
fathom	0	0
knot	0	0
hand	0	0
link	0	0
chain	0	0
Sq. Measure		
sq. in.	3	8.8
sq. ft.	6	17.6
sq. yd.	10	29.4
acre	0	0
township	0	0
sq. mile	0	0
Metric Table:		
gram	2	5.9
meter	0	0
dram	6	17.6
kilometer	0	0
liter	1	2.9
cu. centimeter	0	0
Elec. Measure:		
watts	0	0
ampere	0	0
ohm	0	0
kilowatts	1	2.9
volts	0	0

*Note: This table is read as follows: On reading the first line across, one sees that inches is used by 30 of the 34 women studied which is 88.2 per cent of the total number of women.

TABLE VIII (CONT.)

	Frequency	Per Cent of Total
Cu. Measure:		
cu. in.	1	2.9
cu. ft.	2	5.9
cu. yd.	0	0
cord	1	2.9
Weight:		
grain	2	5.9
oz.	25	73.5
lb.	33	96.9
ton	11	32.3
scruple	1	2.9
pennyweight	0	0
Time:		
second	17	50.0
century	3	8.8
decade	4	11.8
Quantity:		
doz.	29	85.3
teaspoon	33	96.9
tbl.spoon	33	96.9
cases	19	55.3
barrel	7	20.6
gross	4	11.8
quire	1	2.9
ream	1	2.9
Liq. Measure:		
pt.	30	88.2
qt.	30	88.2
oz. (fluid)	7	20.6
gal.	26	76.4
Dry Measure:		
bushel	16	47.0
bale	1	2.9
basket	17	50.0
carload	0	0
crate	5	14.7
bag	23	67.6
cup	30	88.2
box	18	52.9
carton	9	26.5
peck	12	35.3
quart	10	29.4
cases	0	0

TABLE IX

SHOWING THE UNITS OF MEASURE USED BY 21 MEN IN REAL LIFE SITUATIONS

	Frequency	Per Cent of Total
Lin. Measure:		
in.	21	100
ft.	21	100
yd.	16	76.2
rod	0	0
cubit	0	0
furlong	0	0
mile	17	80.8
ft. & in.	21	100
fathom	1	4.7
knot	1	4.7
hand	1	4.7
link	0	0
chain	0	0
Sq. Measure:		
sq. in.	6	28.6
sq. ft.	8	38.1
sq. yd.	3	14.3
acre	0	0
township	0	0
sq. mile	1	4.7
Metric Table:		
gram	1	4.7
meter	0	0
dram	2	9.5
kilometer	0	0
liter	0	0
cu. centimeter	0	0
Elec. Measure:		
watts	1	4.7
ampere	6	28.6
ohm	1	4.7
kilowatts	4	19.0
volts	5	23.7

TABLE IV (CONT.)

NOTING THE UNITS OF MEASURE USED BY 21 [illegible] IN REAL LIFE SITUATIONS

	Frequency	Per Cent of Total
Cu. Measure:		
cu. in.	3	14.3
cu. ft.	3	14.3
cu. yd.	1	4.7
cord	0	0
Weight:		
grain	0	0
oz.	17	80.8
lb.	19	90.2
ton	10	47.5
scruple	0	0
pennyweight	0	0
Time:		
second	16	76.2
century	1	4.7
decade	3	14.3
Quantity:		
doz.	20	95.0
teaspoon	18	85.4
tbl.spoon	17	80.8
cases	9	42.7
barrel	3	14.3
gross	1	4.7
quire	0	0
ream	0	0
Liq. Measure:		
pt.	18	85.4
qt.	18	85.4
oz. (fluid)	1	4.7
gal.	20	95.0
Dry Measure:		
bushel	11	52.2
bale	2	9.5
basket	8	38.1
carload	2	9.5
crate	1	4.7
bag	11	52.2
cup	10	47.5
box	6	28.6
carton	9	42.7
peck	6	28.6
quart	4	19.0
cases	1	4.7

TABLE V

SHOWING THE USES OF [illegible] BY 55 [illegible]
IN REAL LIFE SITUATIONS

	Frequency	Per Cent of Total
Lin. Measure:		
in.	51	93.2
ft.	49	89.6
yd.	46	84.0
rod	2	3.7
furlong	0	0
cubit	0	0
mile	40	72.8
ft. & in.	40	72.8
fathom	1	1.8
knot	1	1.8
hand	1	1.8
link	0	0
chain	0	0
Sq. Measure:		
sq. in.	9	16.6
sq. ft.	14	25.6
sq. yd.	13	23.8
acre	0	0
township	0	0
sq. mile	1	1.8
Metric Table:		
gram	3	5.5
meter	0	0
dram	8	14.8
kilometer	0	0
liter	1	1.8
cu. centimeter	0	0
Elec. Measure:		
watts	1	1.8
ampere	6	11.0
ohm	1	1.8
kilowatts	5	9.1
volts	5	9.1

TABLE V (CONT.)

	Frequency	Per Cent of Total
Cu. Measure:		
cu. in.	4	7.4
cu. ft.	5	9.1
cu. yd.	1	1.8
cord	1	1.8
Weight:		
grain	2	3.7
oz.	42	76.8
lb.	52	95.[illegible]
ton	21	38.4
scruple	1	1.8
pennyweight	0	0
Time:		
second	33	60.1
century	4	7.[illegible]
decade	7	12.8
Quantity:		
doz.	49	89.6
teaspoon	51	93.[illegible]
tbl.spoon	50	91.4
cases	21	38.4
barrel	10	18.2
gross	5	9.1
quire	1	1.8
ream	1	1.8
Liq. Measure:		
pt.	48	88.8
qt.	48	88.8
oz. (fluid)	8	14.8
gal.	46	84.9
Dry Measure:		
bushel	27	49.9
bale	3	5.5
basket	25	45.5
carload	2	3.7
crate	6	11.0
bag	34	61.9
cup	40	72.8
box	24	44.4
carton	18	33.2
peck	18	33.2
quart	14	25.6
cases	1	1.8

CHAPTER X

ADULT EXPERIENCE IN PURCHASING COMMODITIES

It is impossible for the schools to give training in the understanding of all commodities. But by using the Tables XI, XII, XIII we have suggestions, perhaps even a sound basis for selection of the types of problems that have the greatest need for training.

These tables (XI, XII, and XIII) point out the commodities most often bought by a group of adults. The suggestion is that a teacher, desiring to undertake a problem with the children that involved buying would check the buying done by the adults of his community. The commodities bought by the majority of adults could be used as informational problem units.

With such a standard, at least forty-six per cent of the items listed would be good material for informational problem units. Buying food would obviously be the most preferred

type of problem. Some of the others would be buying fuel, soap, clothing, and furniture.

Comparing Tables XI and XII, one notices that men and women do not seem to differ a great deal in the variety of purchases of commodities. Could it be possible that men and women have, to a great extent, similar experiences in buying ordinary things in life? Perhaps it would be well for a study to find out to what extent there is a similarity in purchases. Then the school would have a better idea of what problems are common to both boys and girls. This would be helpful when working on the informational type of problem. Earlier studies show that basic uses of arithmetic in town and country do not differ widely.[1]

Although we might expect women to be the more concerned about furniture, the men were only slightly less interested according to the table. This is true also of fuel and of groceries. In fact men are almost as interested in home purchases as the women are.

[1]C. T. Wise, "Arithmetic Problems Arising in Various Occupations", Elementary School Journal, October 1919.

In personal purchase group, the women are the more frequent buyers. The automobile seems to be largely a man's problem.

This study indicates that the range of purchases for men and women are similar. The experiences of men and women in buying ordinary commodities do not differ enough to make it necessary in many cases to have a separate program for boys and girls in training for intelligent buying.

TABLE XI

SHOWING THE FREQUENCIES AND PERCENTAGES OF ADULT PURCHASES OF COMMODITIES BY 28 WOMEN

SITUATIONS	FREQUENCY	PER CENT OF TOTAL
Home Purchases		
1. furniture		
kitchen	15	53.6
diningroom	7	25.0
livingroom	14	50.0
bedroom	15	53.6
den	5	17.9
playroom	6	21.4
2. fuel		
oil	20	71.4
coal	20	71.4
wood	16	57.1
3. groceries		
meat	28	100.0
fish	26	92.9
vegetables	27	96.5
can goods	28	100.0
4. cooking utensils	21	75.0
5. blankets and sheets	19	67.8
6. draperies and curtains	25	89.3
7. radios	15	53.6
8. refrigeration	8	28.6
9. rental of home	10	35.7
10. paint	15	53.6
11. wall paper	8	28.6
12. lamps	20	71.4
13. rugs	15	53.6
14. linoleum	15	53.6
15. electric cookers	3	10.7
16. kitchen range	3	10.7
17. silver ware	18	64.2
18. dishes	22	78.6
19. phonographs	9	32.1
20. electric appliances	14	50.0
21. furnaces	1	3.6
22. screens	7	25.0
23. mattresses	13	46.4
24. laundry equipment	13	46.4
25. knitting goods	12	42.9
26. fountain pens	19	67.8
27. bicycles	9	32.1
28. soap	28	100.0
29. clocks	20	7.14
30. ping pong table	0	0.

This table is read as follows: On reading the first line across one sees that furniture for the kitchen was bought by 15 of the 28 women studied which is 53.6 per cent of the total number of women.

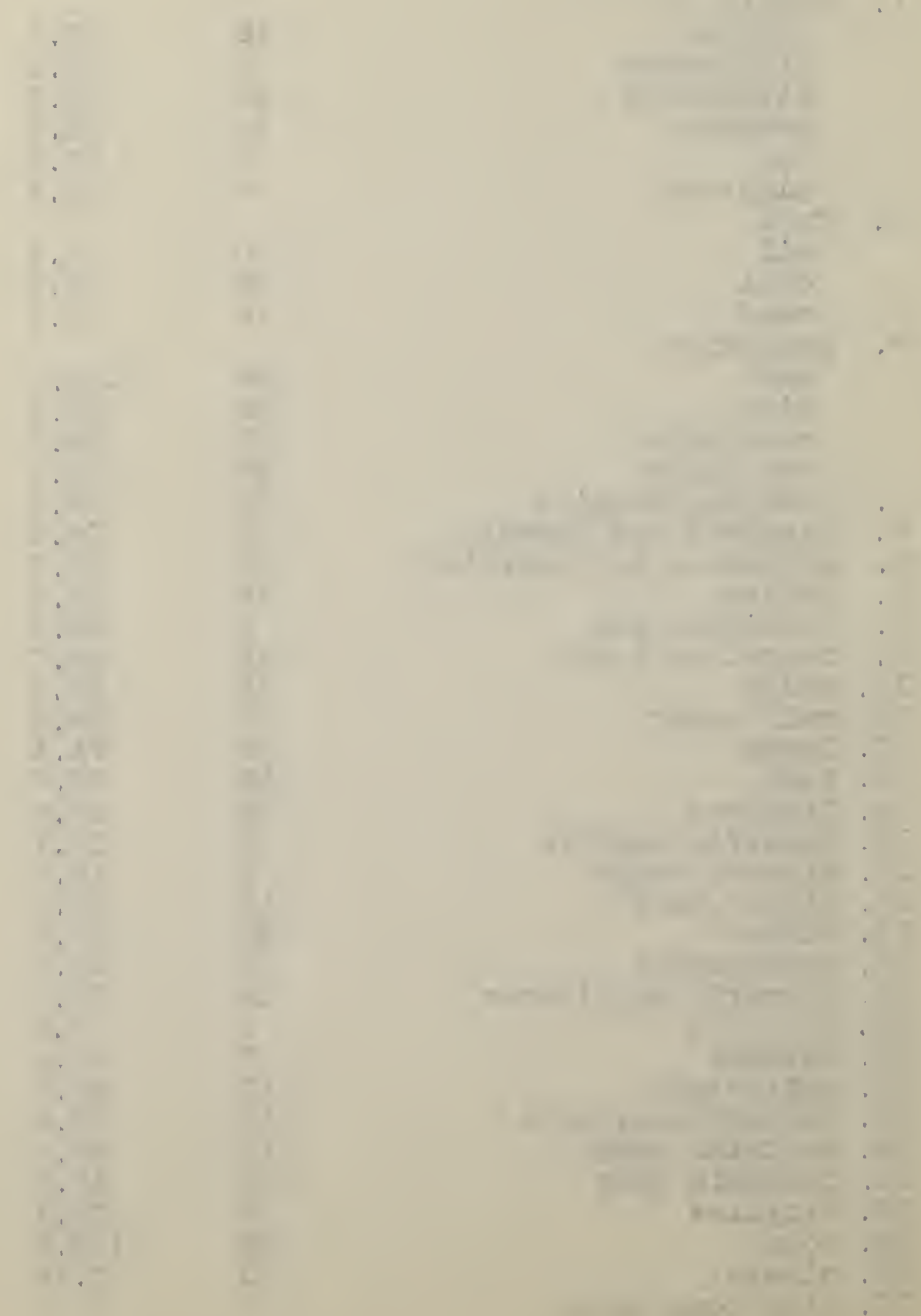


TABLE VI (CONT.)

SITUATIONS	FREQUENCY	PERCENT OF TOTAL
Personal Purchases		
31. clothing		
infants'	24	85.7
children's	24	85.7
women's	27	96.5
men's	19	67.8
shoes	28	100
sport clothes	21	75.0
32. luggage	16	53.6
33. wrist watch	13	46.4
34. eye glasses	11	39.3
35. cameras	8	28.6
36. jewelry	21	75.0
37. shaving equipment	12	42.9
38. perfumes	25	89.3
39. pipe	8	28.6
40. cigarettes	20	71.4
41. hair brushes	23	82.1
42. hair tonic	12	42.9
43. tooth powder or paste	27	96.5
44. toys	27	96.5
45. games	19	67.8
46. flash light	11	39.3
47. carpenters' tools	3	10.7
48. garage mech. tools	1	3.6
49. umbrellas	24	85.7
50. typewriters	8	28.6
Other Purchases		
51. garden seeds	11	39.3
52. sail boat	1	3.6
53. motor boat	0	0
54. garden equipment	5	17.9
55. movie projector	1	3.6
56. camping equipment	1	3.6
57. sport equipment	6	21.4
58. farm equipment	0	0
59. weighing scales	8	28.6
60. supplies (repair of home)	8	28.6
61. musical instrument	4	14.3
62. automobile		
new	1	3.6
second-hand	5	17.9
tires	3	10.7
gasoline	4	14.3
oil	3	10.7
battery	2	7.1
repairs	2	7.1

TABLE VII

SHOWING THE FREQUENCY AND PERCENTAGE OF ADULT PURCHASE OF COMMODITIES BY 19 MEN

SITUATIONS	FREQUENCY	PERCENT OF TOTAL
Home Purchases		
1. furniture		
kitchen	9	47.2
diningroom	5	26.2
livingroom	8	41.9
bedroom	8	41.9
den	3	15.7
playroom	3	15.7
2. fuel		
oil	16	83.9
coal	12	62.9
wood	13	68.3
3. groceries		
meat	19	100
fish	17	89.1
vegetables	19	100
can goods	19	100.
4. cooking utensils	11	57.8
5. blankets & sheets	9	47.2
6. draperies & curtains	5	26.2
7. radios	13	68.3
8. refrigeration	6	31.6
9. rental of home	7	36.7
10. paint	16	83.9
11. wall paper	9	47.2
12. lamps	11	57.8
13. rugs	9	47.2
14. linoleum	11	57.8
15. electric cookers	1	5.2
16. kitchen range	5	26.2
17. silver ware	9	47.2
18. dishes	11	57.8
19. phonographs	8	41.9
20. electric appliances	14	73.5
21. furnaces	2	10.5
22. screens	8	41.9
23. mattresses	7	36.7
24. laundry equipment	3	15.7
25. knitting goods	2	10.5
26. fountain pens	16	83.9
27. bicycles	8	41.9
28. soap	17	89.1
29. clocks	12	62.9
30. ping pong table	3	15.7

TABLE VII (CONT.)

SITUATIONS	FREQUENCY	PERCENT OF TOTAL
Personal Purchases		
31. clothing		
infants'	5	26.2
children's	5	26.2
women's	3	15.7
men's	15	78.8
shoes	19	100
sport clothes	14	73.5
32. luggage	5	26.2
33. wrist watch	15	78.8
34. eye glasses	8	41.9
35. cameras	6	31.6
36. jewelry	8	41.9
37. shaving equipment	18	94.5
38. perfumes	6	31.6
39. pipe	10	52.6
40. cigarettes	17	89.1
41. hair tonic	10	52.6
42. hair brushes	12	62.9
43. tooth powder or paste	19	100
44. toys	11	57.8
45. games	17	89.1
46. flash light	15	78.8
47. carpenters' tools	10	52.6
48. garage mech. tools	10	52.6
49. umbrellas	3	15.7
50. typewriters	3	15.7
Other Purchases		
51. garden seeds	7	36.7
52. sail boat	0	0
53. motor boat	1	5.2
54. garden equipment	5	26.2
55. movie projector	1	5.2
56. camping equipment	2	10.5
57. sport equipment	7	3.7
58. farm equipment	2	10.5
59. weighing scales	3	15.7
60. supplies (repair of home)	7	36.7
61. musical instrument	6	31.6
62. automobile		
new	4	21.0
second-hand	11	57.8
tires	10	52.6
gasoline	12	62.9
oil	11	57.8
battery	9	47.2
repairs	11	57.8

TABLE XIII

SHOWING THE FREQUENCY AND PERCENTAGE OF ADULT PURCHASE OF COMMODITIES BY 47 INDIVIDUALS

SITUATIONS	FREQUENCY	PERCENT OF TOTAL
Home Purchases		
1.		
1. furniture		
kitchen	24	50.9
diningroom	12	25.5
livingroom	22	46.6
bedroom	23	48.8
den	8	17.0
playroom	9	19.1
2. fuel		
oil	36	76.3
coal	32	67.8
wood	29	61.5
3. groceries		
meat	47	100
fish	43	91.2
vegetables	46	97.6
can goods	47	100
4. cooking utensils	32	67.8
5. blankets & sheets	28	59.4
6. draperies & curtains	30	63.6
7. radios	28	59.4
8. refrigeration	14	29.7
9. rental of home	17	36.1
10. paint	31	65.7
11. wall paper	17	36.1
12. lamps	31	65.7
13. rugs	24	50.9
14. linoleum	26	55.2
15. electric cookers	4	8.5
16. kitchen range	8	17.0
17. silver ware	27	57.3
18. dishes	33	69.9
19. phonographs	17	36.1
20. electric appliances	28	59.4
21. furnaces	3	6.4
22. screens	17	36.1
23. mattresses	20	42.4
24. laundry equipment	16	34.0
25. knitting goods	14	29.7
26. fountain pens	35	74.2
27. bicycles	17	36.1
28. soap	45	95.4
29. clocks	32	67.8
30. ping pong table	3	6.4

TABLE XIII (CONT.)

SITUATIONS	FREQUENCY	PERCENT OF TOTAL
Personal Purchases		
31. clothing		
infants'	29	61.5
children's	29	61.5
women's	30	63.6
men's	34	72.1
shoes	47	100
sport clothes	35	74.2
32. luggage	21	44.5
33. wrist watch	28	59.4
34. eye glasses	19	40.3
35. cameras	14	29.7
36. jewelry	29	61.5
37. shaving equipment	30	63.6
38. perfumes	31	65.7
39. pipe	18	38.2
40. cigarettes	37	78.4
41. hair brushed	35	74.2
42. hair tonic	22	46.6
43. tooth powder or paste	46	97.6
44. toys	38	80.6
45. games	36	76.3
46. flash light	26	55.2
47. carpenters' tools	13	27.6
48. garage mech. tools	11	23.3
49. umbrellas	27	57.3
50. typewriters	11	23.3
Other Purchases		
51. garden seeds	18	38.2
52. sail boat	1	2.1
53. motor boat	1	2.1
54. garden equipment	10	21.2
55. movie projector	2	4.2
56. camping equipment	3	6.4
57. sport equipment	13	27.6
58. farm equipment	2	4.2
59. weighing scales	11	23.3
60. supplies (repair of home)	15	31.8
61. musical instrument	17	36.1
62. automobile		
new	5	10.6
second-hand	16	34.0
tires	13	27.6
gasoline	16	34.0
oil	14	29.7
battery	11	23.3
repairs	13	27.6

CHAPTER XI

FINAL CONCLUSIONS

The data of this study show that the interests and experiences of the adults would suggest informational problem-solving units in arithmetic similar to the one developed in Chapter III of this thesis. The validity of responses may be criticised as there are many variables such as memory, understanding, and physical condition of those questioned, but the data, nevertheless, supports the idea of an active program in place of a passive "pouring-in-process" concept of education.

The following is a summary of the findings of this study as indicated by the data:

1. Despite the limited opportunity of these adults to be faced with situations that demanded figuring , arithmetic was a constant and ever-functioning tool. (Chapter V)

2. The data are indicative of the limited amount of situations encountered by an average individual. In fact, when compared with the numerous types of problems as found in the text-book, they are few.[1] (Chapter VI)

3. The kind and amount of problems gives us a suggestion as to textbooks. The suggestion

[1]Dexter, Clara, thesis in preparation.

is that most textbook problem work has little functional value for this group or for a comparable group. (Chapter VI)

4. As a distaste for a subject checks the interest in it, such a large proportion (41%) of the group showing a dislike for arithmetic would seem to indicate an inadequate arithmetic program. (Chapter VII)

5. Sixty-four per cent of the group studied failed to see any value in problem solving as taught from textbooks in the schools. (Chapter VIII) The present tendency in progressive schools is to eliminate the isolated text problems, replacing the same with functional problem units.

6. Measures used by adults are simple and almost always used as a single measure. (Chapter IX)

7. This study indicates that the range of purchases for men and women are similar. The experiences of men and women in buying ordinary commodities do not differ enough to make it necessary in many cases to have a separate program for boys and girls in arithmetic training for intelligent buying. (Chapter X)

The data are in agreement with George A. Brown's[1] understanding of the arithmetic program.

"The language of numbers used to express the relations of size by definite artificial symbols for quantities and the operations by which they are combined, is not a part of the child's common experiences with his fellows.-- For arithmetic the child's experience with the need to combine the strange number symbols is almost a blank page. He must learn the conditions from many experiences which give meaning to the need of arithmetic."

[1] G. A. Brown "School Activities in Relation To Child Life", Journal of Educational Research September 1938 pp. 44-46.

This study points out possibilities in arithmetic which may have more meaning to the pupils. It points toward experience as the basis for problem work in arithmetic. With realism in arithmetic problems, the child is given an opportunity to use his own ingenuity. He doesn't have to be told what to do but suggestions are made as to how to proceed. What he does depends on his own initiative. Materials that exist in his world of living experience are at his command. He isn't confused with ideas that are difficult to perceive due to lack of experience. Instead he gains experience by searching the real world for the data that will tell him a story. Such a program fits in as a remedy to Dr. Murray's[1] analysis of what he thinks is wrong with arithmetic.

He says: "What arithmetic suffers from is a lack of rich content. The processes should

[1]F. M. Murray, "What is the Matter with Arithmetic?" Education, April 1934 pp. 449-451.

never be the main material; for children can manipulate them for a month at a time without gaining a single idea interesting enough to talk about. The heart of arithmetic must be found in its problems. These should deal with vital subjects, and their answers should tell a story. When these facts are recognized, attempts to enrich the curriculum in arithmetic will become fashionable, and that subject will then become progressive. It is progressive in a few schools today, where tool phases are subordinated to purposes."

Thorndike[1] has proven that an individual's development is not dependent upon any one subject. Since the difference in value between studies is so very limited, no study is in itself of superior value in training the intelligence of an individual. Thus, the value of studies is to be decided largely by consideration of the special training which they give.

As Part B of this study indicates that practically all adults have experience in purchasing commodities of various sorts, undoubtedly, here will be found the basis for some profitable problem units.

The purchasing of goods means such a knowledge of the commodity as will enable the buyer to make a wise choice. The arithmetic connected with the decision is only incidental.

[1]E. L. Thorndike "Disciplinary Value of School Subjects" pp 97-98, Journal of Educational Psychology, February 1924.

Mathematics presents a method of thought in which data are collected, organized, and used as a basis of thinking. Such a way of making decisions must be trained into the individual, for contact alone with mathematics is not enough. Wheeler[1], in summarizing the opinions of leading psychologists, says, "No transfer will occur unless the material is learned in connection with the field to which transfer is desired."

[1] R. H. Wheeler, "The New Psychology of Learning," National Council of Teachers of Mathematics Tenth Yearbook p. 223-250.

CHAPTER VIII

BIBLIOGRAPHY

Anderson, [illegible] G. Written Problems in Arithmetic Textbooks. Master's thesis, Boston University 1933.

Baylor, [illegible] B. "Teaching Buyers Buying" School Life 19;119 February 1934.

Bowden, A. O. "Consumers Usses of Arithmetic". Teachers College, Columbia University, Contributions to Education #340, Copyright 1929. An investigation to determine the actual uses made of arithmetic in adult social life, exclusive of vocational uses.

Brown, George A. "School Activities in Relation to Child Life" Journal of Educational Research September 1938 pp. 44-46.

Brown, J. C. "A Summary of some significant conclusions reached by investigators relative to arithmetic", Elementary School Journal [illegible], January 1925, pp. 346-57. Summaries conclusions reached by investigators of arithmetic from the time of Rice to the date of writing.

Brownell and Stretch "The Effect of Unfamiliar Settings on Problem Solving" Duke University Press 1931.

Charters, W. W. "Developing the Attitudes of Children" Education 53; 353-7 February 1933.

Cassels, J. [illegible]. "Rise of Consumer Education" Education 60; [illegible]-[illegible] January 1940.

Clark, J. R. and Vincent, [illegible]. L. "A Comparison of Two Methods of Arithmetic Problem Analysis", Mathematics Teacher, XVIII April, pp. 226-33 Compares conventional and graphic methods of problem analysis.

Bibliography

finds the graphic method results in greater improvement.

Connor, W. L. "What Materials Are Most Useful to Children in Learning to Solve Problems?" Educational Method, VIII April 1954 pp. 369-70
A brief statement based on results on the Stone Reasoning Test. Finds that the best material for teaching problem-solving is that selected by pupils from their own environment.

Connor, W. L. and Hawkins, G. C. "What Materials Are Most Useful to Children in Learning to Solve Problems?" Educational Method pp. 21-29 October 1936.

Cumings, Irene Putting Arithmetic Problem-Solving on a Functional Basis. Master's thesis, Boston University. An informational problem-solving unit on renting an apartment.

Ellsworth, L. E. "What arithmetic do children use in their out-of-school- life?" Boston University, School of Education, Thesis Ed.M. 1939.

Gallgather, F. "Consumer Education Aids" School Life 20;11-12; 4607 September-October 1934.

Gallagher, G. B. Insurance: An informational unit for J. H. S. mathematics, Master's thesis, Boston University, School of Education 1938.

Good, Carter V. "You'll find your problems in your own back yard" Journal of Educational Research September 1930 pp. 42-3.

Bibliography

Graham, J. "Business Education For the Consumer" School Review 42;351-4 May 1934.

Haddell, R. B. "Experimental Course In Methods of Consumer Education" Journal of Home Economics 29;145-50 March 1937.

Harap, Henry "Mathematics for the Consumer", Educational Review, LXXIV October 1927, pp. 162-67. Accepts the purpose of education to be that of learning to do well those things necessary in life and urges teachers of mathematics to study the actual needs of people and plan their courses of study accordingly.

Harnley, R. W. "Attitudes of High-School Seniors Toward Education" School Review 47;501-9 September 1939.

Gaskill, H. V. and others "Measurement of Change In Attitude of Homemaking" Journal of Home Economics 32;173-80 March 1940.

Henniger, L. Arithmetic: Informational Problem Units for Sixth Grade; the Family Budget. Master's thesis, Boston University, School of Education 1935.

Hosic, James F. and Chase, S. L. Brief Guide To The Project Method World Book Company, 1934.

Howe, Florence "Delving into real life through arithmetic problems" Education April 1934.

Hunkins, R. V. and Breed, F. S. "The Validity of Arithmetical Reasoning Tests" Elementary School Journal pp.453-[illegible] February 1933.

Hydle, L. L. and Clapp, F. L. Elements of Difficulty in the Interpretation of Concrete Problems in Arithmetic.

Bibliography

University of Wisconsin,
Bureau of Educational
Research Bulletin #9 1927.

Issenfeldt, L. W. "Teaching Consumer Buying In The Secondary School" Journal of Home Economics 26;280-2 May 1934.

James, G. E. "Study of the Isolated Problems of Four Arithmetic Text Series" Educational Method pp. 198-199 January 1937.

John, Lenore "Difficulties in Solving Problems in Arithmetic" Elementary School Journal XXXI November 1930, pp. 102-15 Reports an analysis of errors made in solving two-step problems in Arithmetic by pupils in the 4th, 5th and 6th grades in two schools.

King, Bettina "Method of discovering interests and experiences of junior high school pupils as a basis for informational problem-solving units in arithmetic" Boston University, School of Education, Ed. M. thesis 1938.

Koeninger, R. C. "Attitude Consistency of High-School Seniors" School Review 44;51[illegible]-34 September 1936.

Koos, L. V. "Consumer Education In The Secondary School" School Review 42;737-50 December 1934.

Kulp, C. L. "A Method of Securing Real Life Problems in the Fundamentals of Arithmetic" Elementary School Journal pp. 428-430 February 1929.

Kyrk, H. "Who Shall Teach The Consumer?" Annals of American Academy 182;41-9 November 1935.

Louth, Mary "Units of Measure in Industry" Master's thesis, Boston University, 1931.

Bibliography

McMurry, Frank M. "What is the Matter with Arithmetic?" Education 54;449-451 April 1934.

Monroe, W. S. "The Derivation of Reasoning Tests in Arithmetic" School and Society pp295-324 September 1918.

Morrison, J. P. "Mass Method Versus Individual Method in Teaching Multiplication to Fourth Grade Pupils" Education 57;345-347 February 1937.

National Council of Teachers of Mathematics Fifteenth Yearbook Teachers College, Columbia University 1940 "The Place of Mathematics in Secondary Education"

National Council of Teachers of Mathematics Tenth Yearbook Teachers College, Columbia "The New Psychology of Learning" R. H. Wheeler.

Neulon, Leon M. "Problem solving in arithmetic" Teachers College, Columbia Univ. 1931.

Newcomb, R. S. "Teaching Pupils How to Solve Problems in Arithmetic" Elementary School Journal pp. 183-189 November 1922.

Overman, J. R. "An Experimental Study of the Effect of the Method of Instruction on Transfer of Training in Arithmetic" Elementary School Journal 31;183-190 November 1930.

Quattlander, E. "Replacing systematic drill with informational units in second grade arithmetic" Boston University, School of Education thesis Ed. M. 1935.

Reich, E. and Siegler C. J. "Teaching the Characteristics of Consumer Goods, Newton High School." Journal of Home Economics 29; 546-8 April 1937.

Rice, R. G. "Education of the Consumer" National Education Association Journal 22; 258-9 December 1933.

Bibliography

Richardson, A. S. "What It Means To Be a Consumer" Woman's Home Companion 67;28 July 1940.

Russell, Celia A. "Banking as the Junior High School Child Should Know It" Master's thesis, Boston University 1934.

Sala, Vincent "Denominate Numbers Used in Factories in New Britain" Master's thesis, Boston University 1931.

Tenenbaum, S. "Uncontrolled Expressions of Children's Attitudes Toward School" Elementary School Journal 40;670-8 May 1940.

Parents' Magazine 15;24 February 1940 "Tomorrow They Buy; Teaching Children Good Buying Habits"

Washburne, C. W. "Comparisons of Two Methods of Teaching Pupils to Apply the Mechanics of Arithmetic to the Solution of Problems" Elementary School Journal pp. 758-767 June 1927.

Weaver, H. G. "Consumer Research and Consumer Education" Annuals of American Academy 182;93-100 November 1935.

White, E. M. "Relation of an understanding of the situation involved in a problem and success in its solution" Boston University, Graduate School thesis A. M. 1932.

Wilson, Dorothy W. "Teaching Denominate Numbers and Measures" Educational Method, 16;177-181 January 1937.
"What Measurements Do People Know and Why?" Master's thesis, Boston University, 1936.

Wilson, Guy M. "A survey of the social and business usage of arithmetic" Teachers College, 1919.
"Criteria of the Written Problem" Education pp. 457-460 April 1934.

Stone, M. B. McDaniel Teaching The New Arithmetic McGraw-Hill Book Company, Inc. 1939.

Wise, Carl T. "Arithmetic Problems Arising in Various Occupations" Elementary School Journal October 1919.